

MEMO

Job **Human Health Conceptual Site Model for Operable Unit 3 – Process Areas,
Yerington Mine Site, NV**
 Client **Atlantic Richfield Company (ARC)**
 Memo no. **1**
 Date **September 23, 2015**
 To **Jack Oman**
 From **Alma Feldpausch, Rosalind Schoof**
 Copy to

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1. Introduction

EPA and ARC discussed high level scoping of Yerington Mine Site (Site) human health risk assessment (HHRA) planning activities during a meeting on January 27, 2015. At that time, it was anticipated that detailed discussions would be necessary to address some technical aspects of the HHRA work plans for operable unit 1 (OU-1), Site-Wide Groundwater, and OU-3, Process Areas. To streamline the work plan development and review process, ARC proposed developing technical memoranda (“tech memos”) to guide early planning discussions such that major issues will be resolved prior to work plan review by EPA and NDEP. In this way, the work plans should not hold significant surprises for reviewers that will cause the HHRA process to be significantly delayed.

The goal of the tech memos is to facilitate discussion between parties and move us toward completion of a draft work plan than can be reviewed as efficiently as possible. We do not anticipate revising this memo; the purpose of the memo is to provide a basis for group discussion. This is a proposed approach to be reviewed by the agencies then discussed together, leading to real-time resolution of technical issues to the greatest extent possible. Following discussion of the subject matter, we aim to document decisions through approved discussion notes and then merge the decisions into the draft HHRA work plan.

This tech memo provides a draft conceptual site model (CSM) for OU-3 and is the first of three memos to support work plan development for the Process Areas OU. This draft CSM reflects our understanding of

Ramboll Environ
 901 Fifth Avenue
 Suite 2820
 Seattle, WA 98164
 USA

T +1 206 336 1650
 F +1 206 336 1651
 www.ramboll-environ.com

current and future site uses, exposure media, populations that may contact exposure media, and the exposure routes by which these populations may contact exposure media.

2. **Risk Assessment Study Area**

A description of the study area is provided in the Process Areas (OU-3) Step-out Soils Characterization Data Summary Report (DSR; Brown & Caldwell 2014) and in Section 9.0 of Scope of Work for Remedial Investigation/Feasibility Studies (Attachment A to the Administrative Order for Remedial Investigation and Feasibility Study, Docket No. 9-2007-0005) (SOW). The risk assessment will be limited to the main Process Areas OU, bounded on the northeast by the Sulfide Tailings, on the northwest by the Oxide Tailings, on the southwest by the Phase IV Heap Leach Pad and Mega Pond, and on the southeast by Burch Drive. Small peripheral Process Areas (i.e., subarea 12 features), such as crushing and pump stations located away from the main Process Areas, also will be included in the risk assessment study boundary. Groundwater underlying the Process Areas OU will be evaluated in the baseline HHRA for OU-1.

A description of the physical setting, sources of constituents, constituent release mechanisms, and environmental transport media will be drawn from the Draft Process Areas (OU-3) Remedial Investigation Work Plan (Brown and Caldwell 2007), updated based on newly acquired and summarized data, and incorporated into the HHRA work plan as necessary. To maintain a focus on key technical issues, these topics have been omitted from this memo.

3. **Current and Future Land Use**

Future use of the Process Areas OU is expected to remain as mining/mineral processing or other industrial activity given the current extensive site modifications for mining, land use designations, and reasonably likely institutional and proprietary controls. The assumption that the Site will remain in industrial use is well-supported and is critical in developing relevant exposure scenarios for the Process Areas OU. As stated in the SOW, "[i]n the long term, the Process Areas may be re-developed for industrial or commercial use." In the unlikely event that future land use does not remain exclusively industrial, it may be necessary to revisit the risk assessment to assess alternate exposure scenarios.

Current land use planning documents support continued industrial use of the Site, including the Process Areas OU. The Mason Valley Environmental Committee (MVEC) submitted a proposal to EPA in February 2007 that outlines preferred uses of the Site (MVEC 2007). In this proposal, land use designations for the Process Areas OU are divided between "light industrial" and "commercial-office" use.

The Lyon County county-wide component of the Comprehensive Master Plan (CMP; Lyon County 2010) provides land use designations for the Site and surrounding non-incorporated portions of Mason Valley. Any changes to current zoning in Lyon County must be consistent with the CMP land use map (Lyon County 2010). Development of the CMP is based on input from the Board of Commissioners, Planning Commission, community advisory councils, County staff, and the

community at large. Input on identifying appropriate land use areas was received during a series of 55 public meetings, open houses, and workshops over a four-year period.

The CMP land use category for the Site is 'employment,' which is characterized by intensive work processes involving service industrial, employment mixed use, manufacturing, or resource handling. Examples include manufacturing, warehousing and distribution, and concentrated mixed-use employment. Land abutting the western and southwestern boundary of the Site is categorized as either employment or public land with the exception of the Weed Heights development, which is categorized as suburban. Land to the northwest and north across from Luzier Lane are categorized as a mixture of agricultural, rural and low density residential, and agriculture mixed with suburban residential. Land northeast, east, and southeast of the Site is categorized as a combination of employment, suburban, and commercial mixed use.

The majority of the land on the Site, including within the Process Areas OU, is owned by the Bureau of Land Management (BLM) or Singatse Peak Services LLC (SPS; see Figure 1). BLM's Draft Resource Management Plan and Environmental Impact Statement for the Carson City District (RMP) designates the Site as open for mineral entry and available for mineral material disposal and nonenergy mineral leasing. Because of restrictions against the transfer of federal lands subject to CERCLA response actions under 42 U.S.C. § 9620(h), BLM lands are likely to either remain in federal ownership in the future or, if they are conveyed to private ownership, be subject to restrictive covenants that preclude residential development and otherwise ensure protection of human health and the environment. Additional Site ownership outside of OU-3 lies with the Walker River Irrigation District and additional private owners, Don Tibbals and Desert Pearl Farms.

Current use within the Process Areas OU is limited to SPS mineral exploration activities: mining equipment and supplies staging, drilling cores storage, geology lab workspaces, and administrative activities. Electrical, gas, and water services to all buildings have been disconnected, except for the SPS administration building and the equipment garage currently occupied by SPS (Brown and Caldwell 2015). SPS retains the option to reinstate mineral exploration activities and owns a claim to minerals on BLM lands. The regulatory agencies, landowners, and potentially responsible parties are discussing additional institutional and proprietary controls that would formalize prohibitions against non-industrial future land use and any utilization of groundwater for potable use.

In accordance with the Superfund Redevelopment Initiative, EPA commissioned the Yerington Mine Site Reuse Assessment (E² Inc. 2010) to document stakeholder reuse goals and inform EPA's remedy selection process. During stakeholder interviews, which included current property owners, Yerington Paiute Tribe staff, city and county staff, and others, EPA's consultant identified the following reuse goals for the Site:

¹ See <https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=renderDefaultPlanOrProjectSite&projectId=22652&dctmId=0b0003e88020e137>

- Promotion of economic development
- Protection of human health and the environment
- Utilization of the Site's assets
- Phasing of Site cleanup and reuse

Three specific stakeholder groups, Yerington Paiute Tribe, Yerington Community Action Group, and Mason Valley Environmental Committee, expressed an interest in "exploring environmentally sustainable economic development options, such as renewable energy generation" (E² Inc. 2010). Ultimately, it was concluded that the most likely future Site use is mining because aside from the stakeholder considerations, future land use determinations rest largely in the hands of the majority land owners and mineral rights owners, BLM and SPS (E² Inc. 2010).

In addition to reliance on current land use, ownership, environmental covenants, the CMP, the RMP, and EPA's Site reuse assessment, assumption of future industrial use for the purpose of risk assessment is supported by EPA's (1995) discussion of land use considerations with remedy selection, which states: "future industrial land use is likely to be a reasonable assumption where a site is currently used for industrial purposes, is located in an area where the surroundings are zoned for industrial use, and the comprehensive plan predicts the site will continue to be used for industrial purposes."

Further to this example, EPA (1995) states that "In cases where the future land use is relatively certain, the remedial action objective generally, should reflect this land use." EPA continues, stating that when land use is relatively certain, alternative land uses do not necessarily need to be considered unless it is impractical to provide a protective remedy under the anticipated land use.

These statements are consistent with EPA risk assessment guidance (1989), which notes that although residential land use is the most conservative choice, an assumption of future residential land use may not be justifiable where, as here, the probability of future residential use at the site is "exceedingly small." EPA risk assessment guidance (1989) suggests that when an alternate land use is incorporated into the risk assessment, it may be advisable to consider a recreational or open space land use: "If the site is industrial and is located in a very rural area with a low population density and projected low growth, future residential use would probably be unlikely. In this case, a more likely alternate future land use may be recreational." Future open space or recreational use is consistent with BLM land uses throughout the West. Ultimately, EPA (1989) recommends that any future land use selection that varies from current land use should be supported with a logical and reasonable argument.

Current Site and surrounding land uses, CMP land use maps, EPA's reuse assessment (E² Inc. 2010), and any future environmental covenant for SPS-owned land inform revision of the CSM and selection of anticipated future land use to be evaluated in the HHRA. As described above, reasonably anticipated future land use will be industrial and more specifically, mining, mineral exploration, and mineral processing. Future open space or recreational use may be considered

for areas owned by BLM following discussions with EPA and NDEP on the relevance of this scenario.

4. Exposure Media

The media in which mine-related constituents may be found currently or in the future are presented in Figure 2. Exposure media include surface and subsurface soil, particulates and vapors in outdoor air, particulates and vapors in indoor air, and storm water. The potential for direct groundwater contact under current conditions is limited to groundwater monitoring activities which are managed under the site-specific health and safety plan for the Site. There is no complete exposure pathway for groundwater with anticipated future land use.

Routes by which contact with exposure media may occur are identified in Figure 2. Primary exposure routes are represented by a closed circle and signify exposure routes that are anticipated to be complete, and possible routes contributing significantly to total exposures for current and future Site users. Secondary exposure routes are represented by an open circle in Figure 2 and are not expected to contribute substantially to total exposures. Incomplete exposure routes are represented by two short dash symbols. These designations of primary and secondary exposure routes are preliminary and do not necessarily correspond to pathways that are intended to be evaluated quantitatively versus qualitatively in the HHRA, but may be useful in focusing technical discussions in the work planning process.

5. Receptor Populations

Human populations anticipated to have contact with exposure media listed in Section 4 are current and future workers and trespassers. These populations are described in Sections 5.1 and 5.2, respectively. There are no current or anticipated future residents or recreational users of the Process Areas OU.

Four full-time ARC contractors are currently employed at the Site to assist with operations, maintenance, Site security, and other activities. At times, these workers drive through the Process Areas OU to access the Evaporation Ponds and Sulfide Tailings OU and Oxide Tailings OU, and to complete safety patrols. On-site workers take water level measurements monthly and collect groundwater samples quarterly at four active monitoring wells within the Process Areas. Although some supplies and tools are stored in the 'blue' and sample preparation buildings in the Process Areas, on-site staff avoids dilapidated buildings, exposed foundations, or other areas where physical harm is a risk. All EPA-designated radiological hazard areas are avoided. The workers are trained in hazardous site operations and their activities are conducted in compliance with the Site's health and safety plan. For these reasons, current Site operations, remediation worker, and maintenance worker scenarios will not be included in the HHRA.

5.1 Current/Future Process Areas Workers

Current SPS workers in the Process Areas OU perform a variety of activities related to mineral exploration. The truck shop building is used by drillers to store pallets and boxes with drilling cores and stage equipment and supplies. The warehouse building, located south of the truck shop, is used to store pallets of drill cuttings and also houses a geology lab with workbenches.

The lab is used by several staff to analyze drilling cores. The ambulance building, located west of the truck shop, is an administrative office space. In addition, mining-related equipment is stored outdoors. Future development of the Process Areas OU will support mining and may include construction of additional office space and/or mineral processing facilities.

Based on our current knowledge of current and anticipated future use, the following worker populations are relevant to the Process Areas OU HHRA:

- Current/future indoor worker
- Future construction/trench worker (short-term employment)

A worker performing long-term, sustained activities outdoors is not a probable population of concern for the Process Areas OU. Outdoor activities are likely limited to those described in Section 5.1.2.

5.1.1 Current/Future Indoor Worker

Office workers in the Process Areas OU spend all or most of their time indoors analyzing drilling cores or performing administrative duties. Potentially complete, primary exposure pathways for indoor workers include:

- Incidental ingestion of and dermal contact with surface soil as indoor dust
- Inhalation of particulates and vapors and radon in indoor air

The indoor office worker is not likely to perform outdoor activities and have direct contact with soil. Instead, it is assumed that the indoor worker contacts soil that has been tracked or blown indoors and is present on interior surfaces as dust. The future scenario may assume subsurface soil is brought to the surface during regrading for additional office space construction and that the subsurface soil may be blown or tracked indoors. If volatile chemicals, including radon, are present in subsurface soil, vapors may infiltrate cracks and spaces in building foundations and migrate to indoor air. Therefore, inhalation of particulates and vapors and/or radon in indoor air is considered a potentially complete, primary exposure pathway for indoor workers.

There are no potentially complete secondary pathways for future indoor workers.

5.1.2 Future Construction/Trench Worker

It is possible that temporary workers will be used to redevelop the Process Areas OU to support mining or other commercial/industrial activities. For the HHRA, it will be assumed that the future worker scenario includes a construction or trench worker who works on-site temporarily to perform demolition or construction activities. These activities may be conducted throughout the Process Areas OU, wherever existing structures are located for demolition or where future structures may be built. Activities associated with demolition and construction may result in contact with exposure media via the following primary exposure pathways:

- Incidental ingestion of and dermal contact with surface and subsurface soil

- Inhalation of fugitive dust
- External radiation exposure from surface and subsurface soil

Construction workers are assumed to contact surface soil from 0 to 2 feet bgs during demolition and construction activities. This depth is recommended for the Process Areas OU as the most relevant for activities such as construction, outdoor maintenance, and landscaping (U.S. EPA 2002). For subsurface infrastructure work, such as excavation and installation of foundations, a trench worker may contact deeper soils to a depth of 10 feet bgs (Sickles 2007, pers. comm.). While working outdoors, the worker may inhale surface soil that has been resuspended and entrained by the wind or vehicle movement. Exposure to external radiation from soil is evaluated for the upper 60 cm of exposed soil only, due to the shielding effect of this soil horizon over lower depths.

Construction and trench workers may also contact chemicals via other potentially complete secondary exposure pathways:

- Incidental ingestion of, dermal contact with, and internal and external radiation exposure from storm water
- Inhalation of vapors and radon in outdoor air

Internal and external radiation from storm water and direct contact with these waters is considered a potentially complete but minor pathway, because these waters are present intermittently and workers are not likely to have contact on a regular basis. If volatile chemicals and/or radon are present in subsurface soil and migrate upward to outdoor air, workers may inhale the vapors and/or radon while working outside. For construction workers, this inhalation pathway is considered a minor pathway because vapors are expected to be dispersed in ambient air. Inhalation of vapors and radon by the trench worker is assumed to be limited to work within a trench or excavation.

Groundwater within the Process Areas OU lies at or below 100 feet bgs and will not be contacted directly by workers performing construction activities. Future environmental covenants / access agreements for the Process Areas OU are likely to prevent any use of alluvial groundwater and so direct contact with groundwater is not anticipated to be a complete exposure pathway for future workers.

5.2 Current/Future Trespassers

Access to the entire Site, including the Process Areas OU, is restricted; however, unauthorized visitors (i.e., trespassers) have historically entered the Process Areas OU to unlawfully collect scrap metal and other materials and equipment. Because the Process Areas OU is not located near or adjacent to a residential area, it is assumed that the trespasser is a young adult or adult as opposed to a young child. Trespassers may contact constituents in outdoor environmental media via the following primary exposure pathways:

- Incidental ingestion of and dermal contact with surface soil

- Inhalation of fugitive dust
- External radiation exposure from surface soil

The following exposure pathways are potentially complete but are considered secondary relative to the pathways listed above:

- Incidental ingestion of, dermal contact with, and internal and external radiation exposure from storm water
- Inhalation of vapors and radon in outdoor air

Because of the limited time spent in the Process Areas OU and limited available activities, contact with storm water and inhalation of vapors and/or radon are expected to be minor exposure pathways. Trespassers are not expected to have contact with subsurface soil, groundwater, and vapors and/or radon in indoor air. These pathways are assumed to be incomplete.

6. References

Brown and Caldwell. 2014. Process Areas (OU-3) Step-out Soils Characterization Data Summary Report, Yerington Mine Site. Prepared for Atlantic Richfield Company. Prepared by Brown and Caldwell, Carson City, Nevada.

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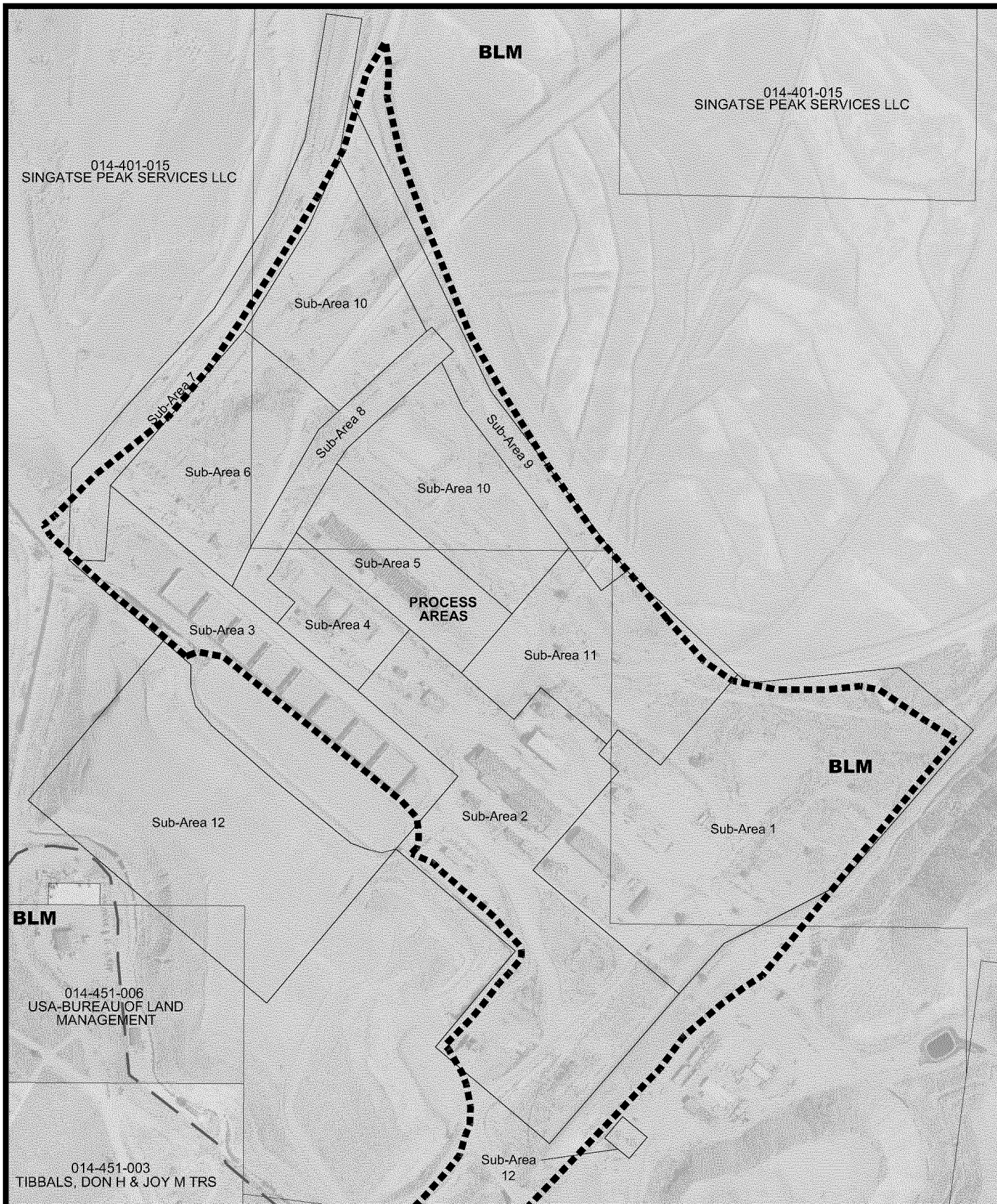
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U.S. Environmental Protection Agency (U.S. EPA). 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER Directive 9355.4-24. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington DC.

U.S. EPA. 1995. Land Use in the CERCLA Remedy Selection Process. OSWER Directive 9355.7-04. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington DC.

U.S. EPA. 1989. Risk assessment guidance for superfund (RAGS): Volume 1 – human health evaluation manual (part A), interim final. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington DC.

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rjohnson



Explanation



Mine Site Boundary

Process Areas Boundary

Sub-Process Area Boundary

- BLM Property
- Singatse Peak Property
- Tibbals Property

Notes:

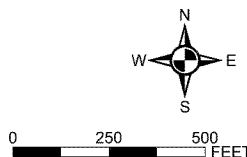
1. Projection: Nevada State Plane, West Zone 1927 North American Datum (Feet).
2. Base photo taken September 2, 2011.
3. Parcel Source Data provided to Brown and Caldwell by Lyon County GIS Data Department in June 2013.

**Brown AND
Caldwell**

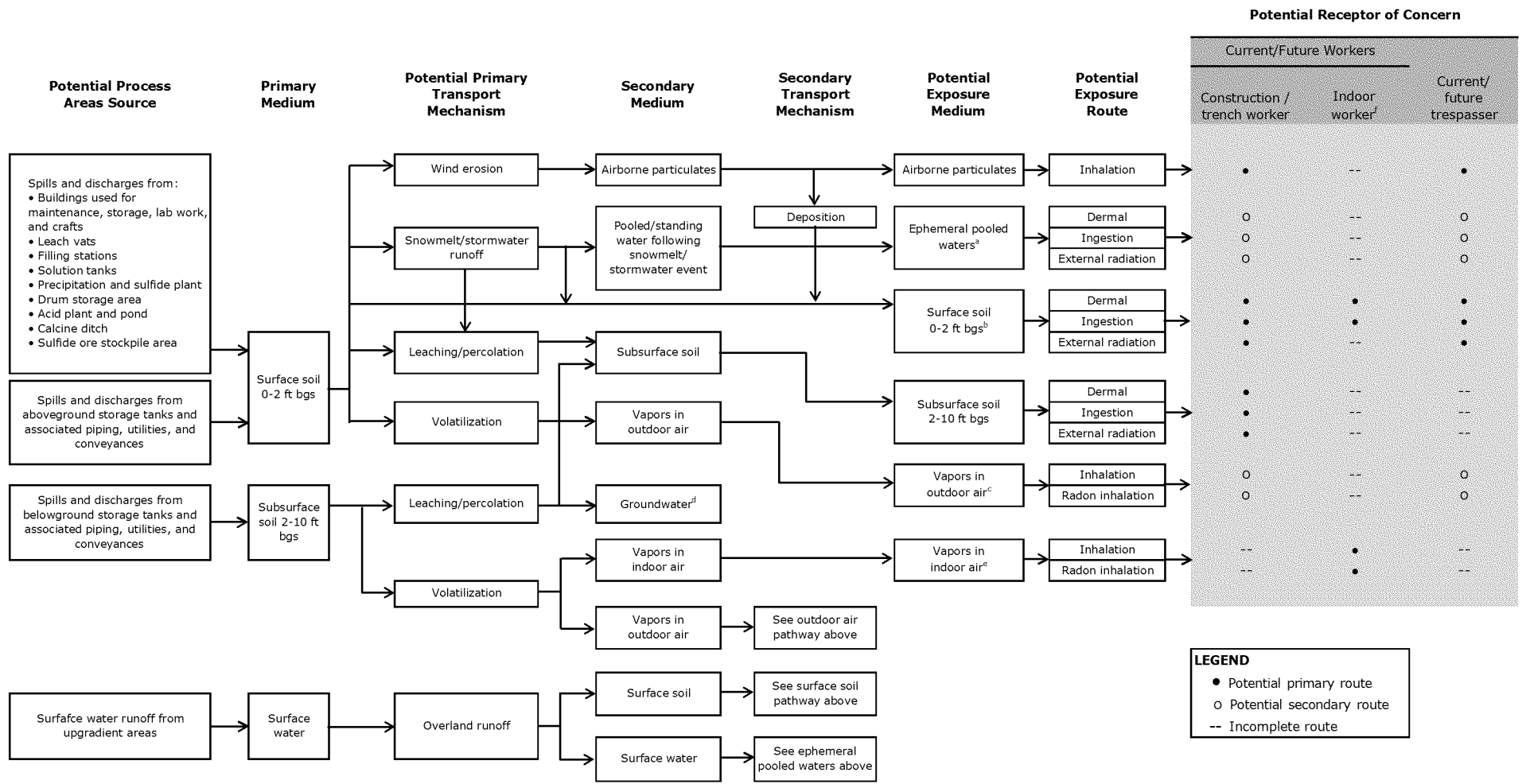
Date: April 2015

Atlantic Richfield
Company

Project: 147641



**Yerington Mine Site
Process Areas
Property Ownership**



Notes:

^a Snowmelt and rain events can lead to temporary pools of water in low-lying areas of the process areas operable unit.

^b For external radiation, surface soil is defined as 0-15 cm bgs.

^c Vapor migration to outdoor air will be evaluated when volatile constituents are found in soil at depths of <100 ft bgs.

^d There is no potential for groundwater contact within OU-3. Any evaluations relevant to groundwater will be evaluated as part of the Site-wide Groundwater Operable Unit remedial investigation and HHRA.

^e Vapor migration to indoor air is evaluated when chemicals are found in soil within 100 vertical or horizontal feet from a building.

^f Contact with surface soil for the indoor worker consists of incidental ingestion of and dermal contact with indoor dust (i.e., soil that has been blown or tracked indoors).

**Conceptual Site Model
Yerintgon Mine Site**

**Figure 2
Human Health Receptor Exposure
Scenarios for OU-3**

